Myriapodology before and after Martin Lister's «*Journey to Paris in the Year 1698*»

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ABSTRACT

The most famous publication of Martin LISTER (1638-1712) was his account of his «*Journey to Paris in the year 1698*». The book is well-known for its detailed descriptions of everyday life in France at the end of the 17th century. Of interest to myriapodologists, however, are the striking illustrations by Father Charles PLUMIER of two myriapods from Brazil, a millipede "*Iulus Americanus*" and a centipede "*Scolopendra Americana*". Indeed, myriapods have featured prominently in zoological literature since the time of Aristotle 384-322 BC. The development of myriapodology has mirrored the scientific revolution since the Renaissance. This paper gives an overview of the passage from folklore and whimsy, through the seminal observations of Leeuwenhoek, the "compendia" of 18th century zoologists including LINNAEUS, culminating with the flowering of scientific myriapodology in the 19th century.

RÉSUMÉ

La myriapodologie avant et après le «*Voyage à Paris en l'an 1698*» de Martin LISTER.

La plus célèbre publication de Martin LISTER (1638-1712) fut sa relation de son «*Voyage à Paris en l'an 1698*». Le livre est surtout connu pour sa description détaillée de la vie quotidienne des français à la fin du 17ème siècle. Il présente cependant un intérêt pour les myriapodologistes, à travers les illustrations saisissantes, dues au Père Charles PLUMIER, de deux myriapodes du Brésil, un diplopode, "*Iulus Americanus*" et un chilopode , "*Scolopendra Americana*". Les myriapodes ont vraiment été éminemment représentés dans la littérature zoologique depuis l'époque d'Aristote (384-322 BC). Le développement ultérieur de la myriapodologie a reflété la révolution scientifique qui s'est opérée depuis la Renaissance. Ce travail se propose de passer en revue cette évolution qui, depuis le folklore et la fantaisie, à travers les observations de Leeuwenhoek, grâce aux précis et traités des zoologistes du 18ème siècle - parmi lesquels figure LINNÉ -, a abouti au développement considérable de la myriapodologie qui a fleuri au 19ème siècle.

INTRODUCTION

"It is a noble employment to rescue from oblivion
those who deserve to be remembered"
Pliny the Younger, Letters V.

Centipedes and millipedes are among the most prominent of terrestrial invertebrates. It should not surprise us to find numerous references to myriapods throughout the literature of the past. However, the modern approach to research emphasises topicality. Work rapidly becomes "out of date". Few scientists have the time to study the books and papers of their predecessors from previous decades, let alone earlier centuries.

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During the latter stages of research for "*Biology of Millipedes*" (HOPKIN & READ, 1992), I began to uncover references to myriapods dating back as far as the 15th century. These discoveries were made too late to include in our book. However, since then I have tracked down more than 50 references to centipedes and millipedes in pre-19th century literature, many illustrated with exquisite woodcuts, engravings and drawings, some in colour.

In this article, I shall give an overview of the development of myriapodology from the time of Aristotle (384-322 BC) to the mid-19th century. Before Martin LISTER's journey to Paris in 1698, most observations on myriapods were apocryphal, or related to medicines. In the late 17th century, and 18th century, the diversity of invertebrate life began to be appreciated. Numerous "compendia" were published, the most important of which was the 10th edition of the *Systema Naturae* of LINNAEUS (1758) which formed the basis of modern nomenclature.

The 19th century saw the application of scientific method to the study of centipedes and millipedes and eventually symphylids and pauropods, although these two groups are not covered here. This was the "Golden Age" of myriapodology. The beauty and accuracy of publications by VON STEIN (1841), WAGNER (1841), NEWPORT (1843), SWAN (1864), and the magnificent coloured plates of KOCH (1863), are testimony of the high standards that can be achieved from long and careful observation with simple equipment. These workers laid the foundations of modern myriapodology and we shall forever be in their debt.

THE DAWN OF MYRIAPODOLOGY

The earliest student of zoology whose work has survived was ARISTOTLE (384-322 BC). Several references to myriapods can be found in translations of his work (e.g. THOMPSON, 1910). In one section on "insects", millipedes and centipedes are recognised as different organisms - "some insects are wingless such as the *Iulus* and the centipede". Elsewhere, the distinction between the "Sea Scolopendra" polychaete worm and "Land Scolopendra" is made, the source of much confusion in later centuries. The comment is made that if a *Scolopendra* is cut in half, the two pieces move off in opposite directions!

PLINY THE ELDER (AD 23-79) brought together earlier bodies of scientific knowledge, most notably in his 37-volume *Naturalis Historia* (FORD, 1992). Translations of Pliny's work (e.g. HOLLAND, 1601) include several references to "multipedes". However, there is confusion as to whether these are centipedes, millipedes or woodlice (terrestrial Isopoda). A description of a cure for "biting of the cheeselips or many feet worms called multipedes" could refer to either.

There is one other pre-Renaissance reference to myriapods in the form of a small woodcut of a "Skolopendra" (Fig. 1) made by a Byzantine artist in AD 512 to illustrate the Greek Herbal compiled in the first century AD. by DIOSCORIDES (GUNTHER, 1934). "Skolopendra" are included due to their supposed medicinal properties. However here, as on numerous other occasions, it is impossible to decide whether centipedes, or marine polychaete worms, are being discussed.

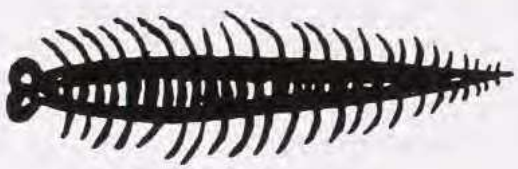

FIG. 1. — Illustration by a Byzantine artist in AD 512 to illustrate the Greek Herbal of DIOSCORIDES (from GUNTHER, 1934).

The real dawn of zoology after the "dark" period of the Middle Ages is connected with the name of an Englishman, Edward WOTTON, born at Oxford in 1492, who practised as a physician in London and died in 1555. WOTTON's *De Differentiis Animalium* (1552) moved away from the mythological creatures of earlier works and towards more factual descriptions.

The earliest unambiguous illustrations of marine polychaete worms appeared in the *Libri de Piscibus Marinis* of RONDELETIUS (1507-1566) published in 1554. The woodcuts of "Sea Scolopendra" included in this important book reappear many times in later centuries and are frequently mis-identified as centipedes.

The first definite illustration of a centipede occurs in the herbal of MATTHIOLUS (1500-1577) published in 1569. The good sale of his smaller herbal in 1554 with small woodcuts caused MATTHIOLUS to prepare a luxurious edition. Ferdinand I whose physician ordinary Matthiolus was made a large contribution towards the cost. The fine woodcuts were done by Giorgio LIBERALE and Wolf MEIERPECK and the blocks were first printed in the German edition printed at Prague in 1563, and then sent to Venice. The illustrations of "Sea Scolopendra" were copied and cited as such from RONDELETIUS (1554). However, there is an original woodcut of a *"Scolopendra"* which is a true centipede (Fig. 2). The animal is clearly drawn from a specimen rather than from memory.

FIG. 2. — A "*Scolopendra*" from MATTHIOLUS (1569).

ALDROVANDI (1522-1605) in *De Animalibus Insectis* (1638) distinguishes between millipedes "*Iulus*", centipedes "*Scolopendra terrestris*" and polychaete worms "*Scolopendra marina*", but unfortunately, the accompanying illustrations of what are clearly *Lithobius*, have 11 or 14 pairs of legs instead of the correct 15 pairs. Indeed, the presence of the correct number of legs on a myriapod as in the illustration of a Brazilian centipede in PISO (1658), is a good guide to the scientific accuracy of the artist.

The writings of WOTTON (1552), and Conrad GESNER (1516-1565) in his huge five-volume *Historia Animalium* (1551, 1558, 1587, 1617), were summarised and illustrated by Thomas MOUFET sometimes MOUFFET, MUFFET or MOFFETT (1553-1604). MOUFET, a contemporary of SHAKESPEARE, studied medicine at Cambridge and Basel, and practised at Ipswich and London. His *Insectorum sive Minimorum Animalium Theatrum* (1634) contains several woodcuts of recognisable myriapods including a *Lithobius* with the correct number of legs (15 pairs), and a rather fine millipede on the title page (Fig. 3). Some editions contain an Appendix of four plates which are rarely seen. On one of these is a copy of the woodcut of the "*Scolopendra*" of MATTHIOLUS (1569) which has "lost" a pair of legs during the copying!

An English version of the work of WOTTON, GESNER & MOUFET was published by Edward TOPSEL (1572-1628) in his *History of Four-footed Beasts and Serpents* (1658). TOPSEL's book contains several pages of delightful prose "concerning the Scolopendrae and

Juli". The Juli "the English after me will call them Gally-worms" - from the resemblance of the numerous legs to oars on a ship - are treated separately from the Scolopendrae, although polychaete worms are included with the latter judging from the accompanying illustrations. Both Scolopendrae and Juli are included with the "Cheeselips" (woodlice) as the "Many-feet", a persistent theme (see e.g. KIRCHER, 1678; SIBBALD, 1684; BRADLEY, 1721; HILL, 1752; SEBA, 1735). Topics mentioned include swarming, metachronal waves of the legs, and the use of myriapods as medicines, particularly for removal of unwanted hair! There are also references on the use of "many feet" as diuretics, a common theme in early medicinal texts (e.g. BOYLE, 1744; JAMES, 1743-1745). Some authors have even reported "multipeda" being excreted with the urine (PARÉ, 1634; ALDROVANDI, 1638).


INSECTORVM
SIVE
Minimorum Animalium
THEATRVM
Olim ab
EDOARDO WOTTONO.
CONRADO GESNERO.
THOMAQVE PENNIO.
inchoatum:
Tandem
THO. MOUFFETI Londinâtis operâ sumptibusq; maximis concinnatum,
auctum, perfectum:
Et ad vivum expressis Iconibus supra quingentis illustratum.
Londini ex Officinâ typographicâ *Thom. Cotes*, 1634.

FIG. 3. — The title page of MOUFET (1634).

The following passages from TOPSEL (1658) describe the effects of centipede bites in vivid detail.

"This Scolopender being provoked bites so sharply that *Ludovicus Armarus* who gave me one brought out of Africa could scarce endure him to bite his hand, though he had a good glove on, and a double linen cloth; for he struck his forked mouth deep into the cloth, and hung on a long time, and would hardly be shaken off"

"When the land Scolopender hath bitten, the place is all black and blue, putrifies and swells, and looks like to the dregs of red wine, and is ulcerated with the first bite"

The *Historiae Naturalis* of JONSTONUS (1657a) and the English translation (1657b) are examples of the pitfalls of plagiarism although to be fair to JONSTONUS, he does cite the sources of his illustrations. Much of the text is based on earlier authors and many of the illustrations are copied from the work of ALDROVANDI, GESNER, MOUFET & TOPSEL. In addition to repeating the mistakes of earlier authors the 22 and 48 legged *Lithobius* of ALDROVANDI are reproduced,

JONSTONUS introduced errors during the copying. Some creatures have "lost" or "gained" legs. The small illustration of a woodlouse, for example, has seven pairs of legs in MOUFET & TOPSEL, but has gained two extra pairs in JONSTONUS's book. This "eighteen-legged woodlouse" still turns up from time to time, most recently in an advertisement for Robinson's Barley Water in the U.K. as part of a series on ancient remedies.

The mid to late 17th century was a period of transition. Work of supreme quality was published at the same time as anecdotal evidence for outdated concepts such as spontaneous generation. The illustrations in KIRCHER (1678) appear to suggest the development of a centipede from a putrifying horsetail plant *Equisetum* (Fig. 4). However, the invention of the microscope enabled Robert HOOKE (1635-1702), Jan SWAMMERDAM (1637-1680) and Anthony van LEEUWENHOEK (1632-1723) to publish some of the most important and original zoological observations ever made.

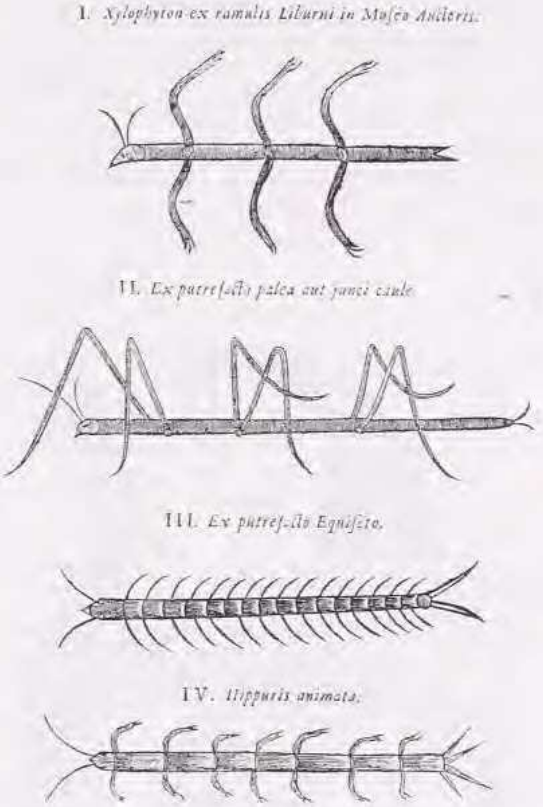

FIG. 4. — "Spontaneous generation" of animals from plants (from KIRCHER, 1678), including a centipede (III) developped from a putrified horsetail (*Equisetum*).

HOOKE's *Micrographia* (1665) does not concern us here as this classic work contains no reference to myriapods. The *Historia Insectorum Generalis* of SWAMMERDAM (1669), English translation (1758) again contains no illustrations of myriapods. However, in one passage, SWAMMERDAM does make some brief observations on myriapods remarking that he is in possession of "a *Scolopendra* of the largest kind which is even a span long and was sent to me from the East Indies". It is to LEEUWENHOEK's *Werken* (1684-1718) that we must turn for the first observations on myriapods displaying true application of scientific method.

LEEUWENHOEK discovered the aperture in the poison claws of centipedes (Fig. 5). In his "Letter 104" sent to the Royal Society on 17th October 1687 from Delft (English translation, 1964), LEEUWENHOEK wrote the following:

"I have often heard people speak about the poisonous nips or Bites, by a certain vermin, which is called Thousand-legs in the East Indies; this vermin as I was told comes to walk on the naked body of sleeping Persons, and as this vermin is very cold, People often become restless when they feel these animals. But if People would lie quietly without moving themselves, the same would not cause People any injury; but owing to this movement, they nip, with the pincers that they have in front of their head into People's bodies; and although there is no effusion of blood following this, and only a small red or blue spot remains where this vermin has nipped into the body, there nevertheless follows an intolerable pain and swelling, which is greater and lasts longer in one Person than in another. To still this pain there is, they say, no more effective remedy than to kill these Centipedes alive in the olive oil, and to rub this oil into the affected part. Last year I instructed the workmen in this city, who receive the goods from the East Indies, to bring me a live centipede, with the intention to discover, if possible, the reason for these harmful bites of the centipede. They thereupon brought me a Centipede the length of a little finger while some others are quite two fingers long and more. I took hold of this Centipede by one of the two pincers, with a small pair of pliers; and on bringing the pincer before the microscope, I saw that the pincers or nippers were continuously being moved towards and away from each other, to nip or grasp something; in which movement I observed at the same time that each of these pincers was provided with a tiny hole, which hole had a small groove or gutter, which was made in such a way as to bring the fluid that came oozing out of this hole to the extreme end of this sharp, sting-like pointed part with which the pincer is fitted.

From these observations, I came to suppose that the Centipede, by nipping with his pincers into People's skin used so much violence that he damaged some blood- and other vessels, and tore them apart, and that, at the same time, he injected the aforesaid fluid into the skin. And I furthermore supposed that this fluid was mixed with an injurious sharp Salt: and that it was not the damage done by the nipping that caused the great pain; but only the suffering inflicted by the noxious fluid.

I had intended to continue my observations this year, and to this end I had instructed the Workmen to catch the Centipedes. But they have not observed any, although several were seen on board ship during unloading of the goods, and were killed there."

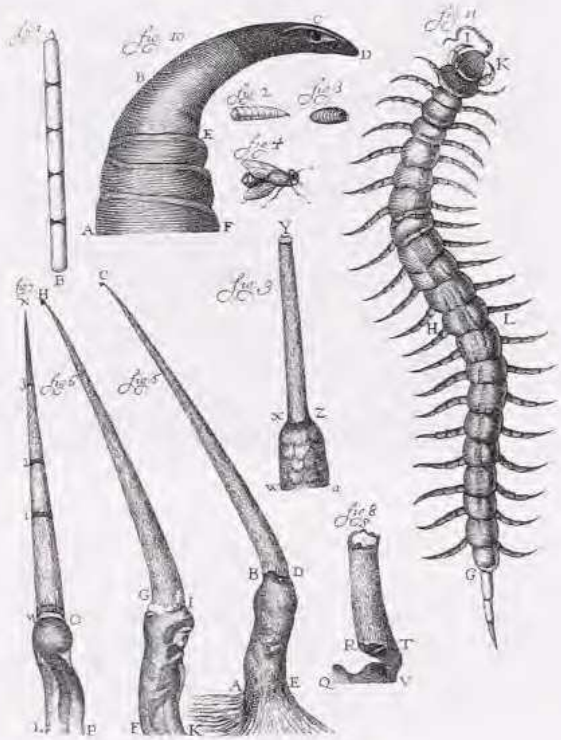

FIG. 5. — A plate from LEEUWENHOEK's *Werken* (1684-1718) sent to the Royal Society on 17th October 1687. "Fig. 10" shows the poison claw of a centipede ("Fig. 11") which has one of its anterior-most legs missing. The other illustrations are of the stings of nettle (*Urtica*).

The observation of LEEUWENHOEK on poison claws were referred to more than a century later by SMELLIE (1790-1799) in his discussion of the effects of centipede bites.

"The poisonous weapons of the *Scolopendra*, or *centipes*, are somewhat different from those of the spider. Its bite is so painful, especially in the East Indies, as we are informed by BONTIUS, that it makes the patient almost mad. When the claws of its forceps are examined by a microscope, on the upper side of each of them, near the point, a small aperture appears, through which the venom is conveyed to the wound. Of the East India centipedes, LEEUWENHOEK had one sent to him alive; and he found that by pressing the claw, a small drop of liquor issued out of this aperture".

LEEUWENHOEK was clearly a man ahead of his time.

MARTIN LISTER'S JOURNEY TO PARIS

Martin LISTER (1638-1712) was an English naturalist who published important books on spiders and snails; for a recent biography of LISTER, see PARKER & HARLEY (1992). In 1698, LISTER was sent by King William III as a medical attendant to William BENTINCK, Earl of Portland, on a diplomatic mission to Paris. He recorded his experiences in the one book he published in English, *A Journey to Paris in the year 1698*.

LISTER's account of his visit to Paris proved very popular and ran to three editions in his own lifetime. It contains much of historical interest and, in particular, its information about scientific, medical and other technical matters as well as its description of the city itself, and the 17th century way of life, are invaluable in their detail.

Included in the book are six folding plates. Two of these are among the most striking illustrations of myriapods ever published. Plate 5 (Fig. 6) shows a large millipede "*Iulus Americanus*" and Plate 6 (Fig. 7) a centipede "*Scolopendra Americana*", both drawn by Father Charles PLUMIER. The centipede was in PLUMIER's collection and was "a foot and a half long, and proportionally broad". LISTER describes seeing the millipede in the collection of Monsieur TOURNEFORT.

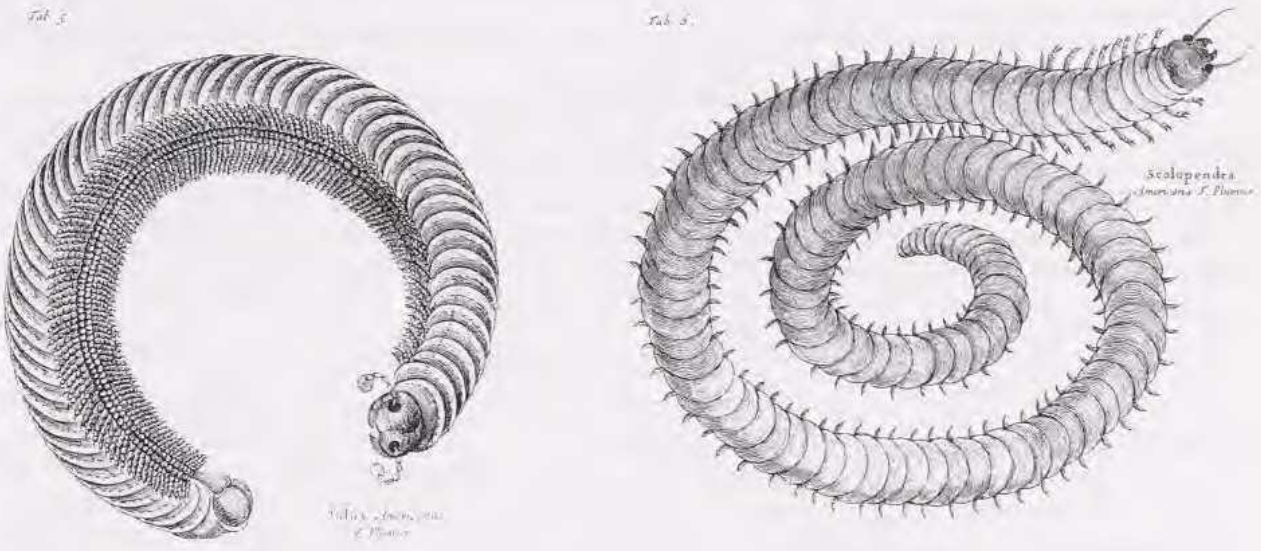

FIG. 6. — Left: "*Iulus Americanus*" drawn by Father Charles PLUMIER (from LISTER, 1699).
FIG. 7. — Right: "*Scolopendra americana*" drawn by Father Charles PLUMIER (from LISTER, 1699).

" He showed me a very great *Julus* from Brazil, at least six inches long, and two about, round like a cord, very smooth and shining, of a kind of copper or brazen colour: the feet infinite, like a double fringe on each side: this he had from F. PLUMIER, who afterwards gave me a design of it drawn by the life and in its proper colours".

For someone used to British myriapods, the sight of these spectacular creatures clearly had a lasting impression on Martin LISTER.

COLLECTION AND CLASSIFICATION

The 18th and early 19th centuries were periods when the huge diversity of animal life began to be appreciated and comprehensively described. The lavish texts of HILL (1752), SCHAEFFER (1766), BARBUT (1781), DONOVAN (1792-1807), GEOFFROY (1799), SHAW (1800-1826), CUVIER (1838-1849), OKEN (1833-1842) and BERNARD *et al.* (1842/1843) all contain illustrations of myriapods, many in colour. Huge collections of specimens were built up. The wealthy Dutchman Albert SEBA (1665-1736) assembled the richest collection of natural history objects of his time. His private museum contained several centipedes and millipedes which are described and illustrated in the catalogue SEBA (1734-1765). SEBA's specimens were purchased by Peter the Great and moved to St. Petersburg.

The most important development of the 18th century was the system of classification introduced by Carolus LINNAEUS (1707-1778) in the first edition of his *Systema Naturae* (1735). The tenth edition (1758) ranks as one of the most important zoological book ever published.

In the first edition of *Systema Naturae* (1735), LINNAEUS recognises five classes of animals. Class 5, the Insecta, is split into four groups namely Coleoptera, Angioptera, Hemiptera and Aptera. The Aptera contains eight "Genera" which are separated mainly on the basis of the number of legs. Woodlice Genus *Oniscus*, "Pedes 14" are distinguished from the myriapods which are all in the Genus *Scolopendria* "Pedes 20" or more. Three "species" are described, *Scolopendria terrestris*, *Scolopendria marina* (polychaete worm), and *Julus*.

LINNAEUS's introductory notes "Observationes in Regnum Animale". Observations on the Animal Kingdom were translated into English by ENGEL-LEDEBOER & ENGEL in the facsimile edition of 1964. Point 8 "Scintillas *Scolopendrae*" is translated as "the luminescence of *Scolopendria marina* a Nereide". However, it seems much more likely that LINNAEUS is referring to terrestrial species in which luminescence has been repeatedly observed (BARBUT, 1781; DONOVAN, 1792-1807; SHAW, 1800-1826).

The classification of myriapods is more detailed in the tenth edition of *Systema Naturae*, with the "Insecta" comprising seven groups, the last of which "Aptera" contains 14 "Genera" numbers 230-243. The centipedes (Genus 242 *Scolopendra* - nine species) are separated from the millipedes (Genus 243 *Julus* - seven species), although nereid polychaetes are still included as *Scolopendra marina*. The names of *Scolopendra electrica* from *elektron*, "a shining substance, amber or an alloy of gold and silver" (EMMET, 1991) and *Scolopendra phosphorea* clearly refer to properties of luminescence. Several of LINNAEUS's names are, of course, still in use today.

THE "GOLDEN AGE" OF MYRIAPODOLOGY

By the early 19th century, myriapods began to be recognised as a group distinct from insects. The catalogue of British insects published by STEPHENS (1829) does not include centipedes or millipedes. The *Nomenclator Zoologicus* of AGASSIZ (1842-1846) contains many genus and family names that are familiar to us today. The *Myriapodum* were divided into two groups: *Chilognatha*, the millipedes comprising the families Glomeridae, Julidae, Polydesmidae, Polyxenidae, Polyzonidae and Siphonophoridae and *Chilopoda*, the centipedes comprising the families Cermatidae, Lithobiidae, Scolopendridae and Geophilidae.

The internal anatomy of millipedes and centipedes began to be studied in detail from the mid 19th century onwards. The standard of draughtmanship of the plates in books by VON

STEIN (1841), WAGNER (1841), SWAN (1864), and the paper by NEWPORT (1843) has not been bettered since. However, the peak of myriapodological illustration must surely be *Die Myriapoden* by Carl Ludwig KOCH (1778-1857) published in 1863. This book contains descriptions of more than 200 species of centipedes and millipedes, each of which is figured in colour plates of breathtaking beauty. These paintings must rank among the most exquisite ever produced and are a fitting tribute to the efforts of earlier myriapodologists. KOCH's *Die Myriapoden* released from relative obscurity what are surely among the most interesting of the least-studied animals. Even NEWPORT (1841) bemoaned the preoccupation of naturalists with insects to the detriment of other arthropods.

ACKNOWLEDGEMENTS

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